

REMARKS

Entry of the foregoing and reconsideration of the application identified in caption, as amended, pursuant to and consistent with 37 C.F.R. §1.111 and in light of the remarks which follow, are respectfully requested.

By the above amendments, newly added dependent claims 35-37 are directed to additional exemplary aspects of the boundary region. Support for such new claims can be found in the instant specification at least at page 9, lines 3-6, taken in connection with page 6, lines 9-11 and 17-20, and Figures 1 and 4 to 17.

In the Official Action, claims 1-3, 9-24 and 27-34 stand rejected under 35 U.S.C. §103(a) as being obvious over U.S. Patent Application Publication No. 2004/0151450 (*Wadsworth et al*) in view of U.S. Patent Application Publication No. 2001/0026667 (*Kawanishi et al*). Claims 4-8 stand rejected under 35 U.S.C. §103(a) as being obvious over *Wadsworth et al* in view of *Kawanishi et al*, and further in view of U.S. Patent No. 7,106,933 (*Han*). Claims 25 and 26 stand rejected under 35 U.S.C. §103(a) as being obvious over *Wadsworth et al* in view of *Kawanishi et al*, and further in view of U.S. Patent No. 6,954,574 (*Russell et al*).¹ Withdrawal of these rejections is respectfully requested for at least the following reasons.

Wadsworth et al does not disclose or suggest each feature recited in independent claim 1. For example, *Wadsworth et al* does not disclose or suggest a core region, comprising an elongate region of relatively low refractive index; and a relatively high refractive index boundary region that surrounds the core region, as recited in claim 1.

¹ The patent number of *Russell et al* cited at page 8 of the Official Action contains a typographical error. The correct patent number has been provided in the form PTO-892 citing such document.

The Patent Office has relied on the optical fiber shown in FIG. 7 of *Wadsworth et al*, alleging that region 430 corresponds to the claimed core region, and regions 440 and 450 correspond to the claimed cladding region. See Official Action at page 2. However, the claimed boundary region is, by definition, present at a boundary of the cladding region. Thus, it is clear that region 450 in FIG. 7 does not correspond in location to the claimed boundary region, as region 440 is located between core region 430 and region 450. It is further noted that *Wadsworth et al* discloses that region 440 is a local minimum refractive index region. Thus, region 440 does not correspond to the claimed boundary region, which is of a relatively high refractive index.

At best, the region of the bulk silica region 470 that is present between regions 430 and 440, corresponds in location to the claimed boundary region. Such region, however, is of a low refractive index material and therefore does not correspond to the claimed relatively high refractive index boundary region. Simply put, *Wadsworth et al* does not disclose or suggest a relatively high refractive index boundary region that surrounds the core region, as recited in claim 1.

Further, *Wadsworth et al* does not disclose or suggest a boundary region having either (1) at most two-fold rotational symmetry or (2) a rotational symmetry that reduces the rotational symmetry of the waveguide to at most two-fold rotational symmetry, the symmetry of the boundary region resulting at least in part from azimuthal variations therein, which are substantially uncharacteristic of the cladding region, as recited in claim 1. Concerning (1), as disclosed in paragraph [0085] of *Wadsworth et al* and in view of FIG. 7, regions 430 and 440, and the region therebetween, are hexagonally shaped. The Examiner has taken the position that "the two fold rotational symmetry is visible in Fig. 7 and Paragraph [0026]." Official Action at page 3. However, regions

430 and 440, and the region therebetween, are hexagonally shaped and have a six-fold symmetry, not at most a two-fold symmetry. With regard to (2), the region between regions 430 and 440 is of the same material as the cladding 470, i.e., bulk silica. As such, the region between regions 430 and 440 of the *Wadsworth et al* fiber do not exhibit azimuthal variations that are uncharacteristic of the cladding region; to the contrary, such region is formed from the same material as the cladding.

In addition, *Wadsworth et al* does not disclose or suggest a core region, comprising an elongate region of relatively low refractive index, as recited in claim 1. This deficiency of *Wadsworth et al* has been acknowledged by the Patent Office at page 3 of the Official Action.

Kawanishi et al fails to cure the above-described deficiencies of *Wadsworth et al*. In this regard, the Patent Office has taken the position that it would have been obvious to modify *Wadsworth et al* by employing therein the low refractive index core of *Kawanishi et al*. See Official Action at page 7. Concerning such alleged modification, however, it is well established that "If the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims *prima facie* obvious." M.P.E.P. §2143.01(VI). In the present case, the fiber shown in Figure 7 of *Wadsworth et al* is specifically designed to provide an effective refractive index of the core which decreases radially outwards from a maximum in region 430 (i.e., the core). See paragraph [0085]. The fiber's principle of operation is based on such radially outward decreasing refractive index, and the high refractive index of the core is critical to achieving *Wadsworth et al*'s desired structure in which the refractive index decreases in a radially outward direction. Clearly, for this reason, it would not

have been obvious to one of ordinarily skill in the art to modify *Wadsworth et al* by employing the low refractive index core of *Kawanishi et al*.

Furthermore, even if *Kawanishi et al* would have been combined with *Wadsworth et al* in the manner alleged by the Patent Office, the resulting combination nevertheless fails to disclose or suggest a relatively high refractive index boundary region that surrounds the core region, as recited in claim 1. As well, the alleged combination does not disclose or suggest a boundary region having either (1) at most two-fold rotational symmetry or (2) a rotational symmetry that reduces the rotational symmetry of the waveguide to at most two-fold rotational symmetry, the symmetry of the boundary region resulting at least in part from azimuthal variations therein, which are substantially uncharacteristic of the cladding region.

The other secondary applied documents (i.e., *Han* and *Russell et al*) fail to cure the above-described deficiencies of *Wadsworth et al*. In this regard, the Patent Office has relied on *Han* for disclosing boundary nodes having specific characteristics. See Official Action at pages 7-8. *Russell et al* has been relied on for disclosing that any beat length can be introduced into a fiber. See Official Action at page 8. However, even if such secondary applied documents would have been combined with *Wadsworth et al* in the manner suggested, the resulting combination nevertheless fails to disclose or suggest a relatively high refractive index boundary region that surrounds the core region, as recited in claim 1. Further, the alleged combination does not disclose or suggest a boundary region having either (1) at most two-fold rotational symmetry or (2) a rotational symmetry that reduces the rotational symmetry of the waveguide to at most two-fold rotational symmetry, the symmetry of the boundary region resulting at least in

part from azimuthal variations therein, which are substantially uncharacteristic of the cladding region.

For at least the above reasons, it is apparent that independent claim 1 is non-obvious over *Wadsworth et al*, *Kawanishi et al*, *Han and Russell et al*, in the manner applied by the Patent Office.

Independent claim 31 is directed to a method of forming a photonic crystal fibre, and recites forming a preform comprising an elongate, relatively low refractive index core region; and forming, at the interface between the core region and the cladding region, a boundary region, comprising one or more relatively high refractive index regions. For at least the reasons discussed above, the applied documents fail to disclose or suggest forming, at the interface between the core region and the cladding region, a boundary region, comprising one or more relatively high refractive index regions, as recited in claim 31.

Independent claim 34 is directed to a method of forming a photonic crystal fibre, and recites arranging a plurality of elongate members, at least some of which are capillaries, into a pre-form stack comprising an elongate cladding region enclosing an elongate core region, the members in the cladding region forming a characteristic pattern, apart from at least one member in a boundary region, at or near to the core region, which breaks the characteristic pattern and renders the boundary region, in the transverse cross-section, no more than two-fold rotationally symmetric about any axis. In view of the discussion above, it is apparent that the alleged combination of applied documents does not disclose or suggest a boundary region which breaks the characteristic pattern and renders the boundary region, in the transverse cross-section, no more than two-fold rotationally symmetric about any axis. By comparison, regions

430 and 440 of the *Wadsworth et al* fiber, and the region therebetween, are hexagonally shaped and have a six-fold symmetry.

For at least the above reasons, it is apparent that the applied documents do not disclose or suggest each feature recited in independent claims 1, 31 and 34.

Accordingly, withdrawal of the above §103(a) rejections is respectfully requested.

From the foregoing, further and favorable action in the form of a Notice of Allowance is believed to be next in order, and such action is earnestly solicited. If there are any questions concerning this paper or the application in general, the Examiner is invited to telephone the undersigned.

Respectfully submitted,

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